A Proposal to Run an Off-Cycle Eta Extension to Partially Meet Immediate Field Requirements for Downscaled Initialization Grids

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Recommendation: The ISST has recommended and EMC has agreed to immediately begin exploring running a limited-domain, Eta model extension through day eight, nested within the GFS solution. This is an effort to provide, as quickly as possible, WFO forecasters with high-resolution model data for use within IFPS in the medium range. The downscaled solution would reflect the coarser synoptic-scale GFS forecast influenced by NDFD-resolution terrain.

Description: Although not finalized, there are likely sufficient computing resources to allow EMC to run an extension of the Eta model on a 12-km grid from 84 to 184 hours on a small, windowed domain twice per day (0600 UTC and 1800 UTC). To allow quick implementation, EMC has identified a shuffling of computing blocks to allow for a more efficient Eta run to 84 hours. If correct, this would allow the 84-h run to be completed in about the same time it currently takes to get to 60 hours. The freed resources would then be used to run the windowed Eta extension to 184 hours.

The Eta extension would be accomplished by taking GFS forecast conditions as lateral boundary conditions at 3-h updates. There would not be any internal nudging toward the GFS solution. The size of the domain would ultimately be determined by the amount of computing resources available; but it is likely the primary domain would only cover the CONUS. Since this excludes Puerto Rico, and the Pacific and Alaska Regions, EMC has suggested that during forecast cycles when the primary extension is not being run (namely, 0000 UTC and 1200 UTC), it could run additional windowed solutions to provide comparable coverage to these OCONUS regions.

To take full advantage of the resulting native, full-resolution model information at EMC, the ISST has recommended that the Smart Initialization process be done centrally for this particular model run. The specific software used will need to be selected and/or revised from several applications currently available. The centralized process will allow detailed vertical information to be used in the downscaling, but not require all the fields be distributed to the WFOs. After the Smart Initialization process is applied, the downscaled (likely 2.5 or 5-km grid) surface grids would be distributed to the WFOs, primarily using regional wide area networks. The specific parameters distributed are not fully known, but would include wind, temperature, dew-point temperature, max/min temperature, and precipitation.

The current plan is to achieve this in several phases, particularly given the added complexity of centralized downscaling. It is likely this will require additional source code and procedural development. So, in lieu of slowing the process, the downscaled Eta will be developed and run first. A select set of full-resolution grids would be distributed from this run via Regional WANS. In addition, a set of SmarInit scripts, uniquely developed to take optimal advantage of the available grids will be available for all WFOs

to use. The provides a reasonable mechanism to initialize with matching CWA boundaries (i.e., no discrepancies). The various phases and target dates are presented at the end of this proposal.

Benefits: This relatively simple change in modeling configuration at EMC would provide badly needed initialization grids through the 8-day forecast period currently being used within the IFPS. Each office is required to introduce a new day-8 forecast by 1800 UTC each day. The current general practice is to either stretch the day 7 forecast through day 8 (essentially a persistence forecast) or cut and paste a different intervening day that the forecaster feels somewhat matches the anticipated weather for day 8. Another technique oftentimes used involves cutting and pasting day 7 into day 8, then applying a gridded 24-hr model trend (day 7 to day 8) to the day 8 grid. The reason many forecasters don't use the available GFS grids is that the currently distributed grids are too coarse in the vertical and horizontal resolution to provide an acceptable first guess – especially in areas of complex terrain. Since this current approach is ad hoc, day 8 immediately starts with boundary discrepancies; it is demanding on forecaster resources and likely leads to less than optimal forecast quality.

The proposed Eta extension would provide a full-physics, high resolution simulation that reflects the interaction of the synoptic guidance provided by the GFS with detailed terrain. It would at least provide the forecaster another choice, namely, to use the new objective guidance (contingent upon whether the forecasters are comfortable with the GFS solution). For example, if the forecasters across several CWAs like the GFS solution, they would have the option to initialize many of the day 8 grids from the Eta extension and have an immediate match across the CWA boundaries. Thus, this Eta extension would provide a better avenue for objective model guidance to impact the GFE forecasts and would decrease forecaster workload, both resulting in an overall improvement in forecast quality and consistency.

Implementation Phases:

PHASE 0. Target completion is late January 2004: As part of the late-Fall/early-Winter bundle of changes to the Eta, NCEP/EMC will extend the current 0-60 hr piece of the Eta forecast suite out to 84 hr. This will free up the run slot currently occupied by the North American 60-84 hr extension, which is the slot to be used in Phase I (~April 2004) for 84-196 hour extension over CONUS (at 06z and 18z) and Alaska, Hawaii and Puerto Rico (at 00z and 12z).

PHASE I. Target completion is early April 2004: This phase involves EMC running the eta extension at 12 km and then distributing via Regional WANs a sub-optimal, but adequate, set of grids. To somewhat compensate Tim Barker has agreed to take this grid set once it is defined and develop a standard set of SmartInit scripts to be distributed to the local offices. The advantage of this is that it allows EMC to focus on getting the extension done as quickly as possible without being sidetracked by the centralized downscaling. This would allow the quickest delivery of the extension to the field

offices. There are ongoing issues being discussed such as bandwidth and what set of grids will be distributed.

PHASE II: Target September 2004: This phase includes developing optimal SmartInit scripts (programs) to be centrally run at EMC to effectively downscale to 2.5 or 5.0 km grid spacing. The transmission of information to the field would change from the multiple levels of the 12 km run to multiple fields for direct ingest into GFE. These fields would include such things as: precip type, max min T, more sophisticated weather, sky, PoP grids.